

refinery, petrochemical or other chemical synthesis streams or other naphtha streams, especially in catalytic cracking reactors, e.g., conventional FCC units which ordinarily employ heavier feeds such as deep cut gas oil, vacuum gas oil, thermal oil, residual oil, cycle stock, whole top crude, and the like. A key element of the present invention is its use of a catalyst comprising a zeolite which zeolite itself has been modified by treatment with a phosphorus compound, combined with a substantially inert matrix material. The catalyst comprises a zeolite component that is necessarily treated with a phosphorus compound.

Rejection Under 35 U.S.C. § 102(b)

Claims 1, 2, 5, 7 and 10 have been rejected under 35 U.S.C. § 102(b) as being anticipated by EP 0323736.

EP 0323736 is cited as disclosing a process for converting C<sub>5</sub>-C<sub>10</sub> paraffinic hydrocarbons into aromatic hydrocarbons and light olefins, wherein the feed can be a coker gasoline, light FCC gasoline, C<sub>5</sub>-C<sub>7</sub> fractions of straight run naphthas and pyrolysis gasoline. The Examiner contends such feeds necessarily boil within the claimed ranges and that the process comprises contacting the feed with a catalyst comprising ZSM-5 or ZSM-11. The Examiner further urges that the reference discloses zeolite with silica to alumina ratio of 100 or less, which "may be treated with a phosphorus compound" (Office Action of October 22, 2001, page 2, bottom line), as well as including a binder material that may be an inactive material such as clay. Inasmuch as the reference does not teach active matrix is required, the Examiner argues that the catalyst contains less than 20 wt.% of active matrix. The Examiner also concludes that the same feed over the same catalyst would inherently provide the same product components required by the present claims. The Examiner has responded to applicants' earlier argument that EP 0323736 fails to positively recite introducing phosphorus into the catalyst by arguing that "on page, lines 42-54, the reference discloses that the zeolite may include various impregnated oxides such as oxides of phosphorus" (Id. at page 5, lines 13 and 14).

This rejection is respectfully traversed.

Applicants maintain their earlier arguments contrasting this reference with the presently claimed subject matter. Moreover, Applicants reiterate their contention that EP 0323736 does not teach phosphorus treatment of the zeolite catalysts suited for use in the process of co-production of aromatics and olefins from paraffinic feedstocks. The reference is silent respecting phosphorus except for its teaching at page 3, lines 46-49 (the same passage relied upon by the Examiner, see above). Specifically this passage teaches the use of zeolites which

can be *free* of oxides incorporated into the zeolites by an impregnation treatment. Thus, these zeolites can be free of oxides incorporated into the zeolites by an impregnation treatment. Examples of such impregnated oxides include oxides of phosphorus as well as those oxides of the metals of Groups IA, IIA, IIIA, IVA, VA, VIA, VIIA, VIIIA, IB, IIB, IIIB, IVB, or VB of the Periodic Chart (emphasis added).

Thus a careful review of the reference shows that it clearly fails to positively recite introducing phosphorus, but rather teaches the contrary, namely that only zeolites which have *not* been phosphorus impregnated are suitable for use. The portion of EP 0323736 relied upon by the Examiner does broadly teach that "zeolites suitable for use in the process of the present invention may optionally include *various elements* ion exchanged, impregnated or otherwise deposited thereon" but such a general teaching cannot be fairly argued to disclose or suggest the phosphorus-containing compound treated catalysts required by the present claims. Accordingly, it is respectfully submitted that one skilled in the art acquainted with the EP reference would not find it obvious to arrive at the invention as presently claimed given the inchoate, anomalous and negative teaching of this reference respecting the incorporation of phosphorus in a catalyst for converting naphtha to light olefins and aromatics. In view of this, withdrawal of this rejection is respectfully requested.

#### Rejections Under 35 USC 103(a)

The Examiner has finally rejected claims 3, 4 and 6 under 35 USC 103(a) as being unpatentable over EP 0323736 for the reasons given above and further

in view of the reference's teachings i) that the catalyst also contains a binder material that may be an inactive material such as clay, ii) the ratio of binder to zeolite may be at least 70:30, and iii) conversion conditions include temperatures ranging from 100° to 700°C, a pressure from 10.1 to 720 kPa and a WHSV from 0.5 to 400. The Examiner acknowledges that the reference does not disclose the claimed amount of phosphorus in the catalyst or all the claimed reaction conditions. Nevertheless the Examiner reflexively contends it would have been obvious for one skilled in the art at the time the presently claimed invention was made to have a) modified the process of the EP reference by including phosphorus in the claimed amounts because one would utilize phosphorus amounts including those that are claimed in order to provide a process providing the "desired type of conversion" and b) modified the EP process by using a catalyst/hydrocarbon feed weight ratio within the range claimed because one would utilize any ratio that would result in the effective conversion of the hydrocarbons to the desired product."

This rejection is respectfully traversed.

As argued above, applicants submit that the EP reference fails to disclose or suggest the use of a phosphorus compound-treated catalyst in the process. The only teaching of this reference respecting phosphorus and catalyst relates to use of zeolites which

can be *free* of oxides incorporated into the zeolites by an impregnation treatment. Thus, these zeolites can be free of oxides incorporated into the zeolites by an impregnation treatment. Examples of such impregnated oxides include oxides of phosphorus (page 3, lines 46-48).

Such a teaching away from phosphorus-treated catalysts clearly fails to provide a disclosure or suggestion of the claimed subject matter of the present application. Accordingly, it is respectfully submitted that the Examiner's reliance upon the EP reference as suggesting the present invention is misplaced. In view of this, withdrawal of this rejection is respectfully requested.

The Examiner has also finally rejected claims 8 and 9 under 35 USC 103(a) as being unpatentable over EP 0323736 as applied to claim 1 above, and further in view of U.S. Patent No. 5,898,089 to Drake et al. (Drake). The Examiner notes the EP reference fails to disclose co-feeding steam with the feed and so relies on Drake as disclosing a process for converting a C<sub>4</sub>+ naphtha hydrocarbon feed to make light olefins such as ethylene and propylene, as well as aromatics in which steam is co-fed with the feed at a weight ratio of steam ranging from 0.1:1 to about 10:1. The Examiner concludes it would have been obvious to one of skill in the art at the time the invention was made to have modified the EP process by including steam with the feed in the amount claimed in order to effectively convert the feed to olefins and aromatics.

This rejection is respectfully traversed.

Given the EP reference's teaching against the use of phosphorus-containing catalysts as noted above, it is highly unlikely that one skilled in the art would combine this reference with Drake. Drake discloses using a catalyst comprising acid-treated zeolite, such as ZSM-5, to process fluid C<sub>4</sub>-C<sub>30</sub> hydrocarbon feed, such as gasolines from cracking processes and naphthas (col. 9, lines 39-46) to convert hydrocarbons to C<sub>6</sub>-C<sub>8</sub> aromatic hydrocarbons and olefins. The catalyst is promoted with a wide variety of compounds including phosphorus-containing compounds that can be converted to phosphorus oxide for "reducing coke deposition." The reference is silent concerning use of "substantially inert matrix material" as required by the present application" and teaches an active matrix material, alumina, as preferred binder (column 3, lines 17-18), although the reference also teaches the presence of clay in the catalyst.

Drake is also completely silent concerning the silica to alumina molar ratio of its catalyst. There is no suggestion or disclosure that the catalyst should contain the "relatively high silica zeolites" having an initial silica/alumina molar ratio of not greater than 70, or preferably above 5 and less than 30 (claim 4) which the present invention requires (see, specification at page 8, lines 30 to 32). It is thus respectfully urged that despite Drake's teachings concerning the co-feeding of

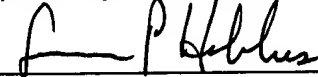
steam, one skilled in the art would lack any incentive to combine these two references.

Accordingly, it is respectfully submitted that the present claims meet the requirements of 35 USC 103(a) notwithstanding the teachings of the EP reference and Drake. Accordingly, withdrawal of this rejection is respectfully requested.

### CONCLUSION

Applicants respectfully submit that the foregoing arguments obviate all of the outstanding rejections in this case and place the application in condition for immediate allowance. Allowance of this application is therefore earnestly solicited.

Respectfully submitted,

By 

Laurence P. Hobbes  
Reg. No. 29,651  
Attorney for Applicants  
(703) 934-7008

January 22, 2002

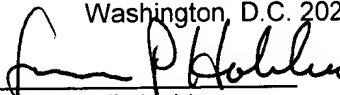
Laurence P. Hobbes  
Roberts, Mlotkowski, & Hobbes, P.C.  
3911 Old Lee Highway Suite 43 B  
Fairfax, Virginia 22030

### CERTIFICATE OF MAILING UNDER 37 CFR 1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:

ATT: BOX AF  
Commissioner for Patents  
Washington, D.C. 20231

on January 22, 2002.

  
Laurence P. Hobbes